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DOE/RL-2005-75
Revision 1

Sampling and Analysis Plan for Support Activities to the 200-UW-1 Operable Unit

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

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EXECUTIVE SUMMARY

This sampling and analysis plan (SAP) defines the approach to conduct characterization sampling at the 200-W-42 Vitrified Clay Pipe (VCP) waste site, located in the 200 West Area in the 200-UW-1 Operable Unit (OU). In addition, sampling will be performed on crib vent risers, a concrete pad, and a portion of the Treated Effluent Disposal Facility (TEDF) pipeline. The latter three efforts support the overall goal of removing a portion of the VCP, and support the proposed placement of engineered barriers over the 216-U-8 and 216-U-12 Cribs. The sampling and removal tasks are collectively referred to hereafter as the 200-UW-1 OU Support Activities project.

The U.S. Department of Energy prepared a focused feasibility study (DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit*[1]) and associated proposed plan (DOE/RL-2003-24, *Proposed Plan for the 200-UW-1 Operable Unit*[2]) that defined the preferred remedial actions for the waste sites in the 200-UW-1 OU. A record of decision is currently being prepared to select the remedial alternative for the waste sites.

However, this SAP is being prepared before the record of decision, so that a portion of the 200-W-42 VCP can be removed to facilitate placement of an engineered barrier over the 216-U-8 and 216-U-12 Cribs by September 30, 2006. In conjunction with preparation of the data quality objectives summary report (CP-26827, *Data Quality Objectives Summary Report for Support Activities to the 200-UW-1 Operable Unit*[3]) and this SAP, a time-critical removal action memorandum (DOE/RL-2005-71, *Action Memorandum for the Time-Critical Removal Action for Support Activities to the 200-UW-1 Operable Unit*[4]), and removal action work plan

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[1]DOE/RL-2003-23, 2005, *Focused Feasibility Study for the 200-UW-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

[2]DOE/RL-2003-24, 2005, *Proposed Plan for the 200-UW-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

[3]CP-26827, 2006, *Data Quality Objectives Summary Report for Support Activities to the 200-UW-1 Operable Unit*, Fluor Hanford, Inc., Richland, Washington.

[4]DOE/RL-2005-71, 2005, *Action Memorandum for the Time-Critical Removal Action for Support Activities to the 200-UW-1 Operable Unit*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

(DOE/RL-2005-78, *Support Activities to the 200-UW-1 Operable Unit Removal Action Work Plan*[5]) are being prepared for the 200-UW-1 OU Support Activities project.

This SAP defines the approach to conduct characterization sampling at the 200-W-42 VCP, and additional locations (TEDF pipeline, concrete pad, and crib vent risers) in the 200-UW-1 OU. The sampling strategy for the 200-UW-1 OU Support Activities project is presented in Chapter 3.0 of this SAP.

The overall goals of the sampling identified in this SAP are to provide the data needed to support waste disposal from excavating the VCP, confirm the selected remedial action for the 200-W-42 VCP, and verify that cleanup goals are attained for the excavated area. The preferred remedial action under consideration for this waste site, as identified in the focused feasibility study (DOE/RL-2003-23), is Alternative 3 – Removal, Treatment, and Disposal. The U.S. Environmental Protection Agency's data quality objective guidance[6] was used to identify project data quality needs, evaluate sampling and analysis options, and document project data quality decisions.

The following sampling strategy was developed based on current site knowledge and likely site remedial actions.

- For this removal, treatment, and disposal site, field radiological surveys will be used to define the areas of highest contamination in the soil surrounding the VCP. The presence of cesium-137 detected during field surveys will be used as a "tracer" to determine areas that require further sampling and analysis. Those areas with detectable radiological contamination will be flagged for collection of samples.
- For the pipeline itself, sampling is needed to confirm that contaminants remaining within the pipeline, or sorbed in the clay, meet the waste acceptance criteria for the disposal

[5]DOE/RL-2005-78, 2005, *Support Activities to the 200-UW-1 Operable Unit Removal Action Work Plan,* U.S. Department of Energy, Richland Operations Office, Richland, Washington.

[6]EPA/600/R-96/055, 2000, *Guidance for the Data Quality Objectives Process*, EPA QA/G-4, U.S. Environmental Protection Agency, Washington, D.C.

facility. As noted in the first bullet, cesium-137 will be used as a tracer to determine areas that require further sampling and analysis.

- For the crib risers, radiological smear samples will be taken from each riser and positive contamination detected with field instruments will be further analyzed at the laboratory. As noted in the first bullet, cesium-137 will be used as a tracer to determine areas that require further sampling and analysis.

- For the concrete pad, randomly selected areas will be sampled to characterize the waste for disposal purposes.

- For the TEDF pipeline, because no radiological or nonradiological constituents are expected to be present, radiological field samples will be analyzed to confirm process knowledge. Field samples with detectable radiological contamination will be sent to the laboratory for further analysis.

- Physical sample collection options for the 200-UW-1 OU Support Activities project may include, but are not limited to, soil grab samples (or the use of other soil sample collection methods), multi-incremental sampling, concrete core sampling, and radiological smear samples. Field-screening data collection options may include visual inspection of the pipeline, and radionuclide testing equipment (Geiger-Mueller meter, and portable sodium iodide detector).

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TERMS

AEA	alpha energy analysis
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
Ci	curie
COC	contaminant of concern
COPC	contaminant of potential concern
CWC	Central Waste Complex
d/min	disintegrations per minute
DOE	U.S. Department of Energy
DQA	data quality assessment
DQO	data quality objective
DR	decision rule
Ecology	Washington State Department of Ecology
EIS	Environmental Information System
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
FFS	focused feasibility study
ft	feet
GEA	gamma energy analysis
GeLi	germanium-lithium
HEIS	*Hanford Environmental Information System* database
HPGe	high-purity germanium
m	meter
mg/kg	milligram(s) per kilogram
N/A or NA	not applicable
NWTPH-K	Northwest total petroleum hydrocarbon – kerosene
OU	operable unit
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
PNNL	Pacific Northwest National Laboratory
QAPjP	quality assurance project plan
QC	quality control
PLM	polarized light microscopy
RL	U.S. Department of Energy, Richland Operations Office
RPD	relative percent difference
SAP	sampling and analysis plan
TEDF	Treated Effluent Disposal Facility
VCP	vitrified clay pipe
WAC	*Washington Administrative Code*
WSCF	Waste Sampling and Characterization Facility

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
If You Know	*Multiply By*	*To Get*	*If You Know*	*Multiply By*	*To Get*
Length			**Length**		
inches	25.4	Millimeters	millimeters	0.039	inches
inches	2.54	Centimeters	centimeters	0.394	inches
feet	0.305	Meters	meters	3.281	feet
yards	0.914	Meters	meters	1.094	yards
miles	1.609	Kilometers	kilometers	0.621	miles
Area			**Area**		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.0836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	Hectares	hectares	2.47	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	Grams	grams	0.035	ounces
pounds	0.454	Kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
Volume			**Volume**		
teaspoons	5	Milliliters	milliliters	0.033	fluid ounces
tablespoons	15	Milliliters	liters	2.1	pints
fluid ounces	30	Milliliters	liters	1.057	quarts
cups	0.24	Liters	liters	0.264	gallons
pints	0.47	Liters	cubic meters	35.315	cubic feet
quarts	0.95	Liters	cubic meters	1.308	cubic yards
gallons	3.8	Liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			**Temperature**		
Fahrenheit sub	tract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			**Radioactivity**		
picocuries	37	Millibecquerel	millibecquerel	0.027	picocuries

1.0 INTRODUCTION

The Hanford Site (Figure 1-1) is a 1,517 km^2 (586 mi^2) Federal facility located in southeastern Washington State along the Columbia River. From 1943 to 1990, the primary mission of the Hanford Site was the production of nuclear materials for national defense. In July 1989, the 100, 200, 300, and 1100 Areas of the Hanford Site were placed on the National Priorities List (40 *Code of Federal Regulations* [CFR] 300, "National Oil and Hazardous Substances Pollution Contingency Plan," Appendix B, "National Priorities List") pursuant to the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA).

The Central Plateau is located in the central portion of the Hanford Site and is divided into three areas: 200 East Area, 200 West Area, and 200 North Area. Operations in the 200 East and 200 West Areas were related to chemical separation, plutonium and uranium recovery, processing of fission products, and waste partitioning. Major chemical processes in the Central Plateau resulted in delivery of high-activity waste streams to systems of large underground tanks called "tank farms." The liquid wastes often were neutralized before being sent to the tanks and later evaporated (concentrated). The storage tanks were used to allow the heavier constituents to settle from the liquid effluents, forming sludge. Low-activity liquid wastes were discharged to trenches, cribs, drains, and ponds, most of which were unlined. The 200 North Area formerly was used for the interim storage and staging of irradiated fuel.

The 200-UW-1 Operable Unit (OU) (Figure 1-2) addresses 33 soil waste sites. These sites range from being rather small (approximate surface area of 2.7 m^2 [30 ft^2] and 1 m [3 ft] in depth) to very large (approximate surface area of 4,645 m^2 [50,000 ft^2] and 61 m [200 ft] in depth).

The map of the Hanford Site provided in Figure 1-1 depicts the 200 West Area. Figure 1-2 identifies the specific waste sites within the 200-UW-1 OU.

This sampling and analysis plan (SAP) defines the approach to conduct characterization sampling at the 200-W-42 Vitrified Clay Pipe (VCP) waste site, and additional locations (Treated Effluent Disposal Facility [TEDF] pipeline, concrete pad, and crib vent risers) in the 200-UW-1 OU. The sampling strategy for the 200-UW-1 OU Support Activities project is presented in Chapter 3.0 of this SAP.

The overall goals of the sampling identified in this SAP are to provide the data needed to support waste disposal from excavating the VCP, confirm the selected remedial action for the 200-W-42 VCP, and verify that cleanup goals are attained for the excavated area. The summary of data needs for this project is presented in Table 1-1.

1.1 PROJECT SCOPE

This SAP includes sampling of four elements that are being removed to support the proposed engineered barrier installation over the 216-U-8 and 216-U-12 Cribs: a portion of the 200-W-42 VCP, as well as crib vent risers, a concrete pad, and a section of the TEDF pipeline. The sampling and removal tasks are collectively referred to hereafter as the 200-UW-1 OU Support Activities project.

Figure 1-1. Hanford Site and Washington State.

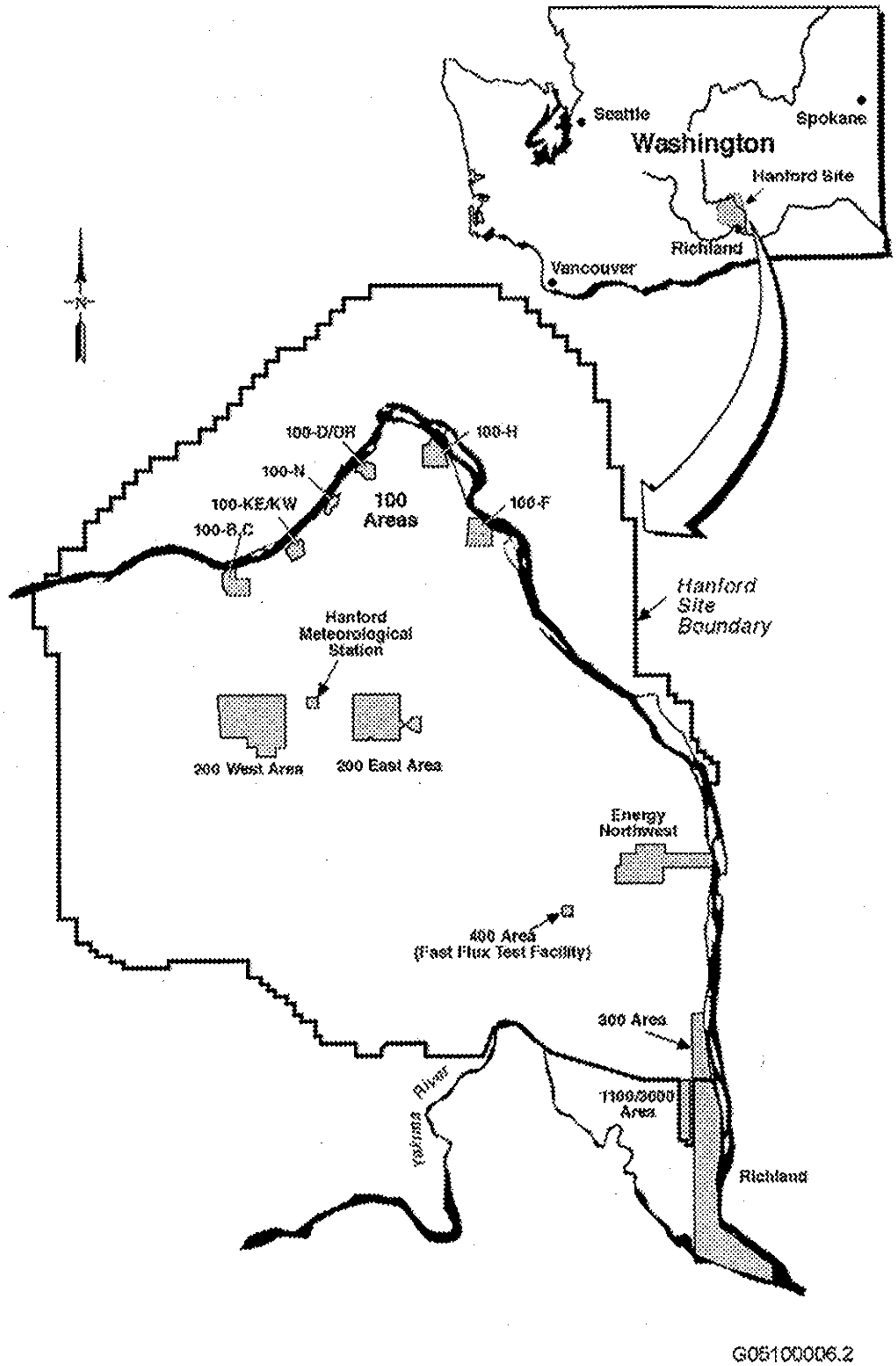


Figure 1-2. U Plant Zone.

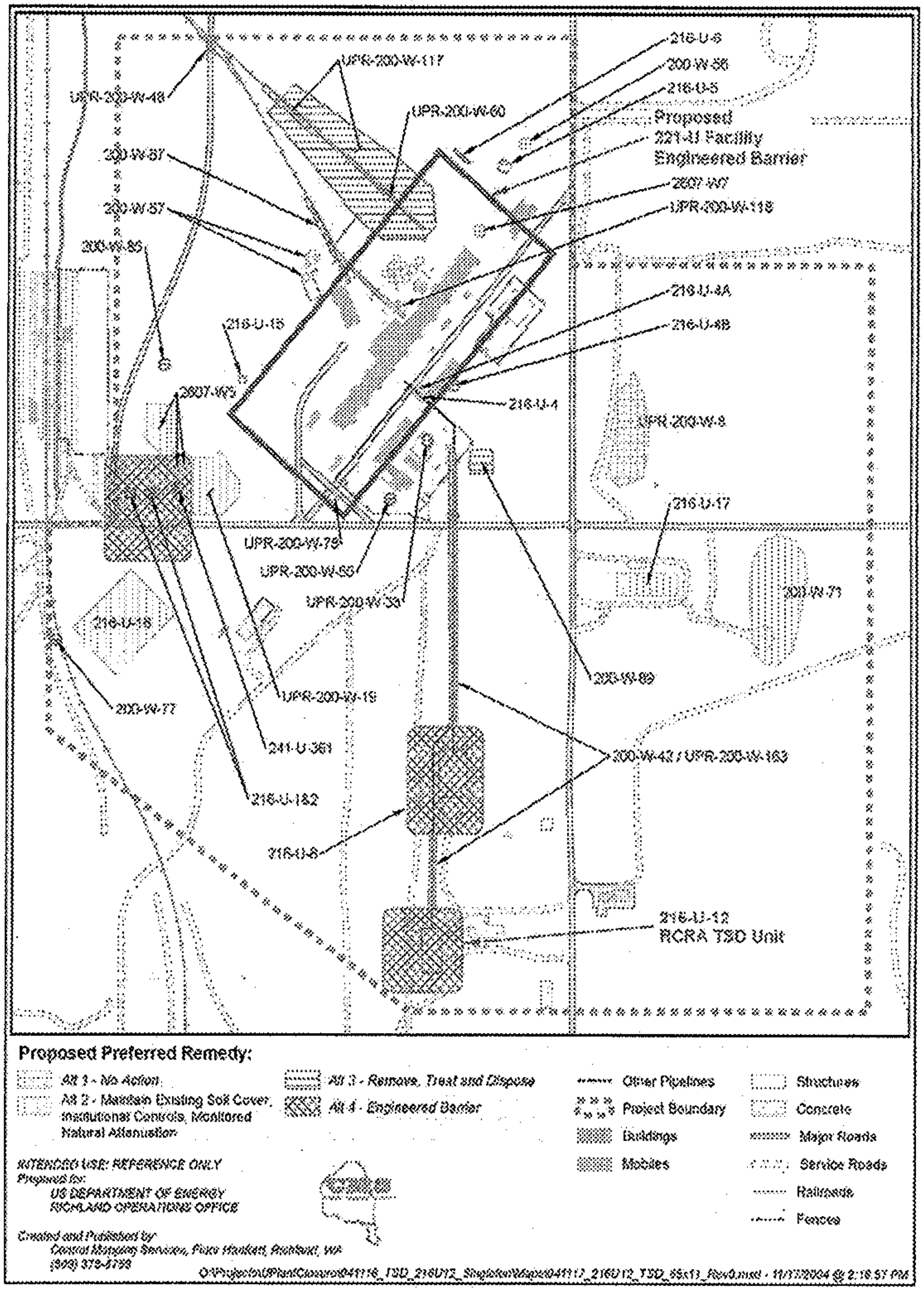


Table 1-1. Summary of Data Needs.

Waste Stream	Contaminants of Concern[a]	Contaminants of Potential Concern[b]	Data Needs	Recommended Approach
Vitrified clay pipe	Cesium-137	Nitrogen as nitrite and nitrate, Antimony, Arsenic, Chromium, Mercury, Selenium, Silver, Thallium, Titanium, Uranium (metal), Asbestos, Bis (2-ethylhexyl) phthalate, Di-n-butyl phthalate, Pentachlorophenol, Kerosene, Acetone, Bromomethane, Chloromethane, Methylene Chloride, Toluene, Chloride, Sulfate, Fluoride, Americium-241, Europium-152, Europium-154, Neptunium-237, Plutonium-238, Plutonium-239/240, Radium-226, Radium-228, Strontium-90, Technetium-99, Thorium-232, Uranium-233/234, Uranium-235, Uranium-238, Cesium-134, Selenium-79.	Waste characterization	Focused sampling based on field detection of cesium-137. See Table 3-1 for additional detail.
Excavated trenches and spoil piles	Cesium-137	Nitrogen as nitrite and nitrate, Antimony, Arsenic, Chromium, Mercury, Selenium, Silver, Thallium, Titanium, Uranium (metal), Asbestos, Bis (2-ethylhexyl) phthalate, Di-n-butyl phthalate, Pentachlorophenol, Kerosene, Acetone, Bromomethane, Chloromethane, Methylene Chloride, Toluene, Chloride, Sulfate, Fluoride, Americium-241, Europium-152, Europium-154, Neptunium-237, Plutonium-238, Plutonium-239/240, Radium-226, Radium-228, Strontium-90, Technetium-99, Thorium-232, Uranium-233/234, Uranium-235, Uranium-238, Cesium-134, Selenium-79.	Waste characterization; termination data	For spoil piles: Focused sampling based on field detection of cesium-137. If no detectable contamination can be located, random sampling will be performed. See Table 3-1 for additional detail. For excavated trenches: Multi-incremental sampling, with focused or discrete sampling for the volatile organic compounds. See Table 3-1 for additional detail.

Table 1-1. Summary of Data Needs.

Waste Stream	Contaminants of Concern[a]	Contaminants of Potential Concern[b]	Data Needs	Recommended Approach
216-U-8 and 216-U-12 Crib vent risers	Cesium-137	Americium-241, Europium-152, Europium-154, Neptunium-237, Plutonium-238, Plutonium-239/240, Radium-226, Radium-228, Strontium-90, Technetium-99, Thorium-232, Uranium-233/234, Uranium-235, Uranium-238, Cesium-134, Selenium-79.	Waste characterization	Radiological smear sample and laboratory analysis for radiological constituents. See Table 3-1 for additional detail.
Concrete pad near the 216-U-8 and 216-U-12 Cribs	Cesium-137	Nitrogen as nitrite and nitrate, Antimony, Arsenic, Chromium, Mercury, Selenium, Silver, Thallium, Titanium, Uranium (metal), Asbestos, Bis (2-ethylhexyl) phthalate, Di-n-butyl phthalate, Pentachlorophenol, Kerosene, Acetone, Bromomethane, Chloromethane, Methylene Chloride, Toluene, Chloride, Sulfate, Fluoride, Americium-241, Europium-152, Europium-154, Neptunium-237, Plutonium-238, Plutonium-239/240, Radium-226, Radium-228, Strontium-90, Technetium-99, Thorium-232, Uranium-233/234, Uranium-235, Uranium-238, Cesium-134, Selenium-79.	Waste characterization	Random sampling of gridded concrete pad. See Table 3-1 for additional detail.
Treated Effluent Disposal Facility pipeline	N/A	Americium-241, Europium-152, Europium-154, Neptunium-237, Plutonium-238, Plutonium-239/240, Radium-226, Radium-228, Strontium-90, Technetium-99, Thorium-232, Uranium-233/234, Uranium-235, Uranium-238, Cesium-134, Selenium-79, Cesium-137.	Waste characterization; verification of process knowledge	Radiological smear sample to verify process knowledge. See Table 3-1 for additional detail.

[a]Contaminants of concern for representative sites were identified in the DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit*, risk assessment process.
[b]Contaminants of potential concern were identified based on process knowledge and past sampling and analysis data.
N/A = not applicable.

The scope of this project includes the data quality objective (DQO) process and development of this SAP for the 200-UW-1 OU Support Activities project to confirm the preferred remedial action for the 200-W-42 VCP waste site, support future remediation of the remainder of the 200-W-42 VCP, and provide characterization data for waste disposal. Overall sampling efforts for the 200-UW-1 OU Support Activities project include the following:

- Waste characterization sampling. Data collection for waste materials (i.e., VCP, soil, concrete, steel piping) to ensure compliance with Environmental Restoration Disposal Facility (ERDF) waste acceptance criteria (BHI-00139, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*).

- Site closeout sampling. Data collection to verify that the bottom of the excavation at the 200-W-42 VCP attains cleanup goals.

- Remedy confirmation sampling. Data collection to confirm that the site conceptual model for the 200-W-42 pipeline agrees with the site conceptual model used to recommend the preferred remedial alternative.

For the 200-UW-1 OU Support Activities project, sampling will be accomplished before the 200-UW-1 OU record of decision is issued to support removal of the pipeline in time to allow the proposed construction of an engineered barrier. The DQO summary report (CP-26827, *Data Quality Objectives Summary Report for Support Activities to the 200-UW-1 Operable Unit*) and this SAP were prepared concurrently with a time-critical removal action memorandum (DOE/RL-2005-71, *Action Memorandum for the Time-Critical Removal Action for Support Activities to the 200-UW-1 Operable Unit*) and removal action work plan (DOE/RL-2005-78, *Support Activities to the 200-UW-1 Operable Unit Removal Action Work Plan*).

To support the 200-UW-1 OU Support Activities project to install engineered barriers over the 216-U-8 and 216-U-12 Cribs (Figure 1-3), the following actions are addressed under the time-critical removal action memorandum (DOE/RL-2005-71), the removal action work plan (DOE/RL-2005-78), and this SAP.

- Excavate approximately 256 m (840 ft) of the 200-W-42 VCP, which is approximately half of the total length of the pipeline, sample the pipeline trench, and backfill the trench area (sampling of the trench will provide characterization data that will be of use for other removal and remedial activities, such as the groundwater and the 200-UW-1 OU projects). In addition, the remaining pipeline from the north end of the 216-U-8 excavation to 16th Street, and the pipeline north of 16th Street to the 270-W Tank have been added to this workscope.

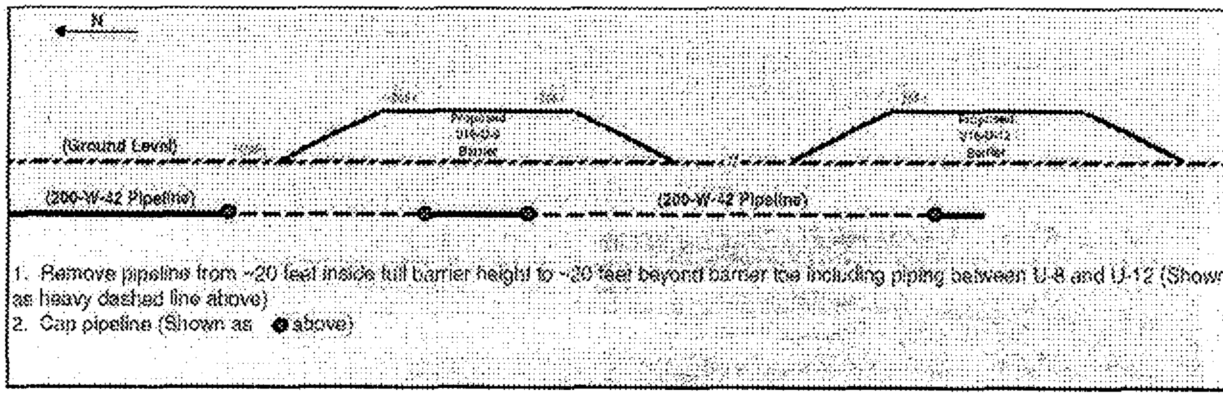
- Reroute approximately 253 m (830 ft) of the TEDF wastewater pipeline and remove approximately 31 m (100 ft) of the pipeline.

- Remove a 31 by 46 m (100- by 150-ft) concrete slab.

- Remove and seal three crib vent risers.

- Relocate any miscellaneous markers or utilities.

Figure 1-3. Proposed Construction of Crib Barriers (i.e., 216-U-8 and 216-U-12) and Removal, Treatment, and Disposal of 200-W-42 Vitrified Clay Pipe Waste Site.



1.2 PROJECT GOALS

The goals of this project are: (1) Use historical and process knowledge to the maximum extent practical to identify the chemical and radiological hazards within and around the 200-W-42 VCP; (2) Determine if existing data are sufficient to characterize waste materials for disposal at the ERDF in the 200 West Area; (3) Identify the waste streams that will be generated during the removal action, including the VCP, soil, TEDF piping, concrete slab, and risers; (4) Establish sampling and analytical requirements for any materials needing additional characterization; (5) Remove sections of the 200-W-42 VCP in accordance with the preferred alternative selected through the focused feasibility study (FFS) process; (6) Perform all activities in a manner that is protective of human health and the environment.

1.3 PROJECT ASSUMPTIONS

The following project assumptions are based on project team discussions from regular team meetings and input received during the DQO scoping checklist review. In addition, interviews with the key decision makers were held to provide a forum for eliciting ideas and issues for inclusion in the DQO process.

1. The project has historical characterization data (BHI-00033, *Surface and Near Surface Field Investigation Data Summary Report for the 200-UP-2 Operable Unit* and BHI-00034, *Borehole Summary Report for the 200-UP-2 Operable Unit, 200 West Area*) associated with the past investigations associated with the 200-W-42 VCP and the 216-U-8 and 216-U-12 Cribs. The data have been used to establish the primary sources of contamination and to support the determination of the list of contaminants of concern (COC). These data are analyzed in DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit* (FFS). The list of contaminants of potential concern (COPC) and COCs derived from the FFS is presented in the DQO summary report (CP-26827) and this SAP.

2. The 200-W-42 VCP is not anticipated to contain substantial amounts of free liquid, but may contain scale and/or sludge that could be sampled.

3. A concrete pad and three risers associated with the 216-U-8 and 216-U-12 Cribs also will be dispositioned as part of this removal action. Sampling of these waste items will be required to aid with waste profiling and designation, and to ensure that the ERDF waste acceptance criteria (BHI-00139) are met.

4. Rerouting of the TEDF pipeline is anticipated to result in generation of waste (i.e., portions of steel pipe) that will be disposed of as part of this project. Because the TEDF pipeline is administratively controlled to ensure that hazardous and radiological waste is not discharged to this pipeline, only confirmatory radiological field surveys and laboratory sampling are anticipated to be required to characterize the waste.

5. Based on existing information, soil and/or debris removed from this waste site are not anticipated to require ex situ treatment to meet disposal requirements at the ERDF or to reduce waste volumes. Contaminated soil will be containerized on site and transported to the ERDF, located near the U Plant Area in the 200 West Area. Low-level radioactive waste and/or hazardous waste are acceptable for disposal at the ERDF, in accordance with the waste acceptance criteria (BHI-00139).

6. Pipeline composition (e.g., vitrified clay) and integrity (i.e., collapsed or structurally sound) also would be considered in making sampling decisions.

7. After the clean cover and contaminated soil are removed, uncontaminated soil would be used to backfill the excavation. The backfill material likely will come from the ERDF spoils pile.

8. The final disposition of the adjacent cribs (216-U-8 and 216-U-12) is not within the scope of the DQO summary report (CP-26827) or this SAP. These cribs are discussed in these documents because the 200-W-42 VCP carried waste to the cribs. Final disposition of the cribs will be documented in a record of decision prepared for the remaining waste sites within the 200-UW-1 OU.

1.4 200-W-42 VITRIFIED CLAY PIPE CONTAMINANTS

As shown by the risk assessment in the 200-UW-1 FFS, the 200-W-42 VCP waste site is contaminated with Cs-137 (COC) at levels that represent human health direct exposure and terrestrial wildlife exposure. Based on discussions with the U.S. Department of Energy, Richland Operations Office (RL) and the Washington State Department of Ecology (Ecology), sampling activities will include analysis for Cs-137 as a COC and analyses for those contaminants listed in the FFS as COPCs. The combined list of contaminants is presented in Table 1-2, and their corresponding detection levels listed in Table 2-2.

Table 1-2. 200-W-42 Vitrified Clay Pipe Contaminants of Potential Concern and Contaminants of Concern.

Nonradioactive Contaminants	Radioactive Contaminants
Nitrogen as nitrite and nitrate	Americium-241
Antimony	Cesium-137
Arsenic	Europium-152
Chromium	Europium-154
Mercury	Neptunium-237
Selenium	Plutonium-238
Silver	Plutonium-239/240
Thallium	Radium-226
Titanium	Radium-228
Uranium (metal)	Strontium-90
Asbestos (contained in vitrified clay pipe only)	Technetium-99
Bis (2-ethylhexyl) phthalate	Thorium-232
Di-n-butyl phthalate	Uranium-233/234
Pentachlorophenol	Uranium-235
Kerosene	Uranium-238
Acetone	Cesium-134
Bromomethane	Selenium-79
Chloromethane	
Methylene chloride	
Toluene	
Chloride	
Sulfate	
Fluoride	

1.5 DATA QUALITY OBJECTIVES

EPA/600/R-96/055, *Guidance for the Data Quality Objectives Process*, EPA QA/G-4, was used to support the development of this SAP. The DQO process is a strategic planning approach that provides a systematic process for defining the criteria that a data collection design should satisfy. Using the DQO process ensures that the type, quantity, and quality of environmental data used in decision making will be appropriate for the intended application.

This section summarizes the key outputs resulting from the implementation of the seven-step DQO process. For additional details, refer to CP-26827.

1.5.1 Statement of the Problem

Characterization data are needed to support waste (soil, VCP, concrete rubble, steel pipe) disposal in the ERDF. Process knowledge, as well as field sampling and laboratory analytical data regarding the concentrations of radiological and chemical constituents, are needed for waste profiling and designation, and to ensure compliance with the disposal facilities' waste acceptance criteria.

In addition, verification sample data are needed to ensure that removal action objectives (as identified in the removal action work plan [DOE/RL-2005-78]) have been met following excavation of the 200-W-42 VCP site.

To support achievement of the removal action objectives through sampling and analysis, the 200-W-42 VCP has been divided into two decision units. The first decision unit includes the excavated trench between 216-U-8 and 216-U-12 Cribs and approximately 40 feet of excavated trench north of 216-U-8 Crib. The second decision unit includes the remaining excavated trench north of 216-U-8 Crib to the south side of 16th Street and the excavated trench north of 16th Street to the 270-W Tank. Further information on the decision units and sampling requirements are included in Section 3.1.1, Table 3-1.

1.5.2 Decision Rules

Decision rules are developed during the DQO process and generally are structured as "IF…THEN" statements that indicate the action that would be taken when a prescribed waste site condition is met. Decision rules incorporate the parameters of interest (COCs and COPCs), the scale of the decision (waste site boundaries), the action level (risk-based criteria), and the resulting action (remediation needs). The decision rules are summarized in Table 1-3.

Table 1-3. Decision Rules.

DR #	Decision Rules
1	**If** process knowledge or the maximum sample concentration for contaminated materials is determined to exceed the ERDF waste acceptance criteria, **then** the materials will be evaluated for storage at the CWC in accordance with DR #2 through DR #8, as applicable. **If** process knowledge or the maximum sample concentration for contaminated materials is determined to not exceed the final action levels, **then** the materials will be evaluated for disposal at the ERDF in accordance with DR #2 through DR #8, as applicable.
2 – 8*	**If** process knowledge or the maximum sample concentration for contaminated materials indicates that the materials are to be designated as listed, characteristic, toxic, persistent, PCB, or asbestos-containing material, **then** materials will be evaluated for treatment or disposal at the ERDF, or storage at the CWC in accordance with DR #9. **If** process knowledge or the maximum sample concentration for contaminated materials indicates that the materials are not to be designated as listed, characteristic, toxic, persistent, PCB, or asbestos-containing material, **then** materials will be evaluated for being sent to a solid waste landfill in accordance with DR #9.

Table 1-3. Decision Rules.

DR #	Decision Rules
9	**If** process knowledge or the maximum sample concentration dictate land disposal restriction-imposed treatment, **then** the materials will be treated and disposed of at the ERDF or stored at the CWC pending future treatment and final disposal. **If** process knowledge or the maximum sample concentration does not dictate land disposal restriction-imposed treatment of the materials, **then** the materials will be disposed of at the ERDF.
10	**If** process knowledge or the maximum sample concentration for materials indicates that the materials are likely to be reused or recycled, **then** the materials will be further surveyed against site release criteria. **If** process knowledge or the maximum sample concentration for materials indicates that the materials are not likely to be reused or recycled, **then** the materials will be disposed of in accordance with DR #1 through DR #9.
11	**If** the maximum sample concentration for soil in the bottom of the excavation indicates that the soil remaining exceeds the action levels, **then** further excavation will be performed; or further analysis of potential risk to human health and the environment will be analyzed, and a remedy for the 200-W-42 VCP in association with the 200-UW-1 OU will be evaluated by the Tri-Parties. **If** the maximum sample concentration for soil in the bottom of the excavation indicates that the soil remaining does not exceed the action levels, **then** the results will be documented and no further remedial action will be required.

*DR #2 through DR #8 support waste designation.

CWC = Central Waste Complex.
DR = decision rule.
ERDF = Environmental Restoration Disposal Facility.
PCB = polychlorinated biphenyl.

1.6 GENERAL SAMPLE DESIGN CONCEPTS

The nature of the 200-UW-1 OU waste sites supports the use of focused sampling as well as multi-incremental sampling, as identified in Ecology 94-49, *Guidance on Sampling and Data Analysis Methods*. This guidance document defines "focused sampling" as selective sampling of areas where potential or suspected soil contamination can reliably be expected to be found if a release of a hazardous substance has occurred. The guidance does not define multi-incremental sampling.

These waste sites have attributes such as visible surface debris, known discharge release points in engineered structures such as cribs or french drains, or subsurface debris that can be identified by surface geophysics techniques, or have a primary constituent which has a gamma/and or beta emitter that can be identified by surface/near surface radiological surveys. Therefore, sampling in a focused manner will ensure data collection of the area of greatest impact associated with the release for waste characterization purposes. Additional efforts may be needed to determine the worst-case location for the sample(s) collection within these sites, such as driven soil probes and gamma logging, which will provide additional data on gamma-emitting radionuclides to support the focused sampling regime.

Sampling locations would be selected during site walk downs by prime contractor technical staff familiar with the 200-UW-1 OU and the waste sites in question. The primary judgment used in selecting sample locations/materials is field-screening results (e.g., detectable radioactive contamination as defined with field instruments) or suspicious locations/materials based on visual inspection (e.g., stained soil areas or debris known to represent hazardous/dangerous/ radioactive waste in the past). The Tri-Parties (U.S. Department of Energy [DOE], U.S. Environmental Protection Agency [EPA], and Ecology) agency personnel typically participate in the walk downs and are asked to concur with the sample locations/materials selected.

For the excavated trenches, multi-incremental sampling will be used. At least 50 increments of sample will be collected for analyses covering the entire length and width of each trench.

1.6.1 Focused Sampling

Focused sampling designs are appropriate for waste characterization to ensure compliance with the receiving facilities' waste acceptance criteria. Statistical sampling designs will not be implemented for this portion of the sampling effort. Samples will be collected from site locations where existing analytical data, process knowledge, and field radiological surveys indicate maximum contamination, or "worst case," concentrations are expected to establish the maximum concentrations of the contamination. The number of samples, the depth of sampling, the types of samples, and their locations would be developed judgmentally based on site knowledge. Details of the focused sampling design are presented in Chapter 3.0.

1.6.2 Statistical Sampling

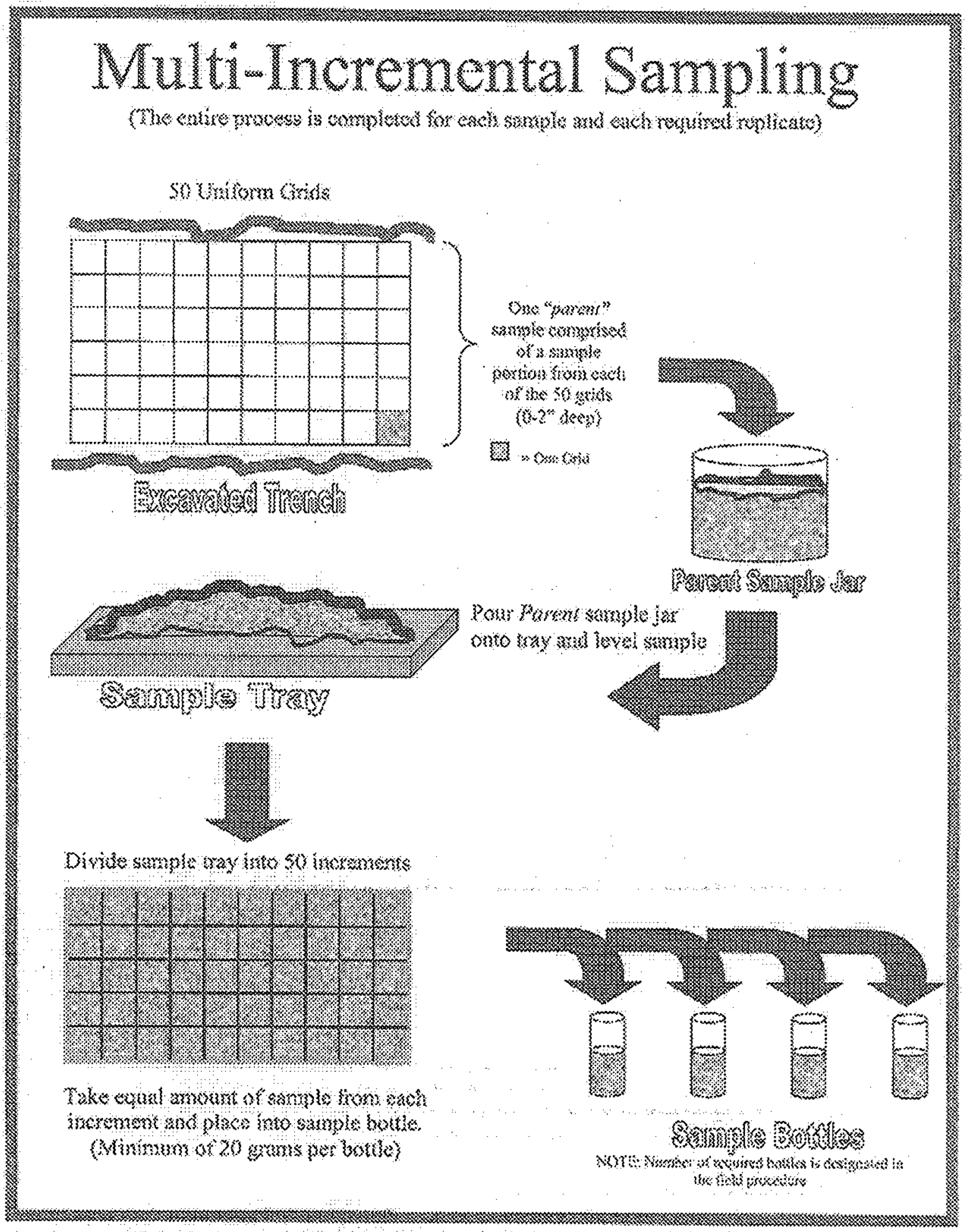
A statistical sampling design will be used for characterization of the waste generated from removal of the concrete pad, because this site has no identifiable release point. Therefore, the pad will be surveyed for radiological contamination using a systematic grid (the concrete pad will be divided into 1 by 1 m [3- by 3-ft] sections) approach to determine the distribution of the contamination. Historical data, professional judgment, and/or field-screening data would be used to identify likely contaminated areas for placement of a sampling grid.

1.6.3 Multi-Incremental Sampling

The multi-incremental method of sampling is used to control the fundamental error, as well as the grouping and segregation error for an average, based on collecting an adequate sample mass (Ramsey et al. 1989, Pitard 1993, Gy 1998, Gerlach and Nocerino 2000, Ramsey 2004, Smith 2004).

For the sampling effort in the bottom of each trench, and possibly the side-walls, each trench will be divided into 50 grids, with a sample portion collected from each grid from 0-2 inches in depth, and accumulated in one container, which will be referred to as the "parent" sample. The soil composing the parent sample will then be sub-sampled in a fifty increment tray, with each sample bottle for analysis holding one portion of each of the 50 increments in the tray. At a minimum, at least three bottles of sample material will be used per analysis. The minimum sample amount for analysis will be 20 grams in each bottle. The laboratory will process the entire sample volume in a bottle for one analysis. The diagram (Figure 1-4) provides a visual representation of the multi-incremental sampling process. Field replicates will be collected as identified in Section 3.1.1, Table 3-1. Samples for volatile organic compounds will continue to be collected as discrete, focused samples.

Figure 1-4. Multi-Incremental Sampling.



1.6.4 Radiological Field Screening

For the sampling effort, field screening will be used to establish site radiological contamination levels. In addition, field screening for radiological contamination (Cs-137) may be used as a "tracer" to locate areas of chemical contamination. If field-screening results indicate the presence of radiological contamination, the areas can be further characterized with laboratory analytical samples. Further details regarding field screening are presented in Chapter 3.0.

1.7 WASTE DISPOSITION OPTIONS

Project activities will result in generation of waste. The majority of the contaminated media likely will be designated as low-level waste; however, quantities of mixed waste, dangerous waste, and solid waste not contaminated with hazardous substances may be generated.

Waste generated will be disposed of at an appropriate disposal site, most likely the ERDF. Recycling and/or reuse options will be evaluated and implemented where possible to reduce the volume of material disposed.

Contaminated waste for which no reuse, recycle, or decontamination option is identified would be assigned an appropriate waste designation (e.g., solid, asbestos, polychlorinated biphenyl, radioactive, dangerous, or mixed) and disposed of at an approved disposal location. For the purposes of this project, most of the contaminated waste generated during implementation of this project is assumed to be disposed of onsite at the ERDF. Alternate potential disposal locations may be considered during the project if a suitable and cost-effective location is identified. Alternate potential disposal locations will be evaluated using appropriate performance standards to ensure that they are adequately protective of human health and the environment.

The ERDF is considered to be onsite for management and/or disposal of waste from this project. There is no requirement to obtain a permit to manage or dispose of CERCLA waste at the ERDF. It is expected that the great majority of the waste generated during the project can be disposed of onsite at the ERDF. For waste that must be sent offsite, including the Central Waste Complex, The EPA must make a determination in accordance with 40 CFR 300.440, "National Oil and Hazardous Substances Pollution Contingency Plan," "Procedures for Planning and Implementing Off-Site Response Actions," regarding acceptability of the proposed disposal site for receiving this CERCLA removal action waste. Because the Central Waste Complex is considered offsite for the management of CERCLA waste from this project, an offsite determination must be made by the EPA before shipment of project waste to the Central Waste Complex.

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2.0 QUALITY ASSURANCE PROJECT PLAN

The QAPjP establishes the quality requirements for environmental data collection, including sampling, field measurements, and laboratory analysis. This QAPjP complies with the requirements of the following:

- DOE O 414.1C, Quality Assurance
- 10 CFR 830, Subpart A, "Quality Assurance Requirements"
- EPA/240/B-01/003, EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations, EPA QA/R-5, as amended.

The following sections describe the quality requirements and controls applicable to this investigation. Correlation between EPA/240/B-01/003 (QA/R-5) requirements and this chapter is provided in Table 2-1.

Table 2-1. Quality Assurance Crosswalk.

EPA QA/R-5 Criteria	EPA QA/R-5 Title	Reference Section
Project Management	Project/Task Organization	2.1, 2.1.1
	Problem Definition and Background	1.0, 1.1, 1.2, 1.6.1
	Project Task Description	1.0, 1.1, 1.2
	Quality Objectives and Criteria	1.5, 2.2, 2.3
	Training/Qualifications	2.1.2
	Documents and Records	2.6, 2.7
Data Generation and Acquisition	Sample Process Design	1.6, 3.1, 3.2
	Sampling Methods	1.6, 3.1, 3.3, Table 3-1
	Sample Handling and Custody	2.4, Table 2-3, 3.4
	Analytical Methods	2.3, Table 2-2
	Quality Control	2.2, 2.3, Table 3-1
	Instrument/Equipment Testing, Inspection and Maintenance	2.3.1
	Instrument/Equipment Calibration and Frequency	2.3.1, 2.5, 2.7
	Inspection and Acceptance of supplies and consumables	2.3.1
	Non Direct Measurement	1.4, Table 1-2, Table 2-2
	Data Management	2.6

Table 2-1. Quality Assurance Crosswalk.

EPA QA/R-5 Criteria	EPA QA/R-5 Title	Reference Section
Assessment and Oversight	Assessment and Response Actions	2.5.2
	Reports to Management	2.5.3
Data Validation and Usability	Data Review, Verification and Validation	2.6
	Verification and Validation Methods	2.7
	Reconciliation with User Requirements	2.8

EPA = U.S. Environmental Protection Agency

2.1 PROJECT MANAGEMENT

The following subsections address the basic areas of project management and will ensure that the 200-UW-1 OU Support Activities project has a defined goal, the participants understand the goal and the approach to be used, and the planned outputs have been appropriately documented.

2.1.1 Project/Task Organization

The primary contractor, or its approved subcontractor, will be responsible for collecting, packaging, and shipping soil and other media samples to the laboratory. The project organization, in regard to sampling and characterization, is described in the subsections that follow and is shown graphically in Figure 2-1. With the exception of the DOE On-Scene Coordinator, all other roles and responsibilities are completed by the primary contractor or its approved subcontractor. Note: For each functional primary contractor role, there is a corresponding oversight role within DOE.

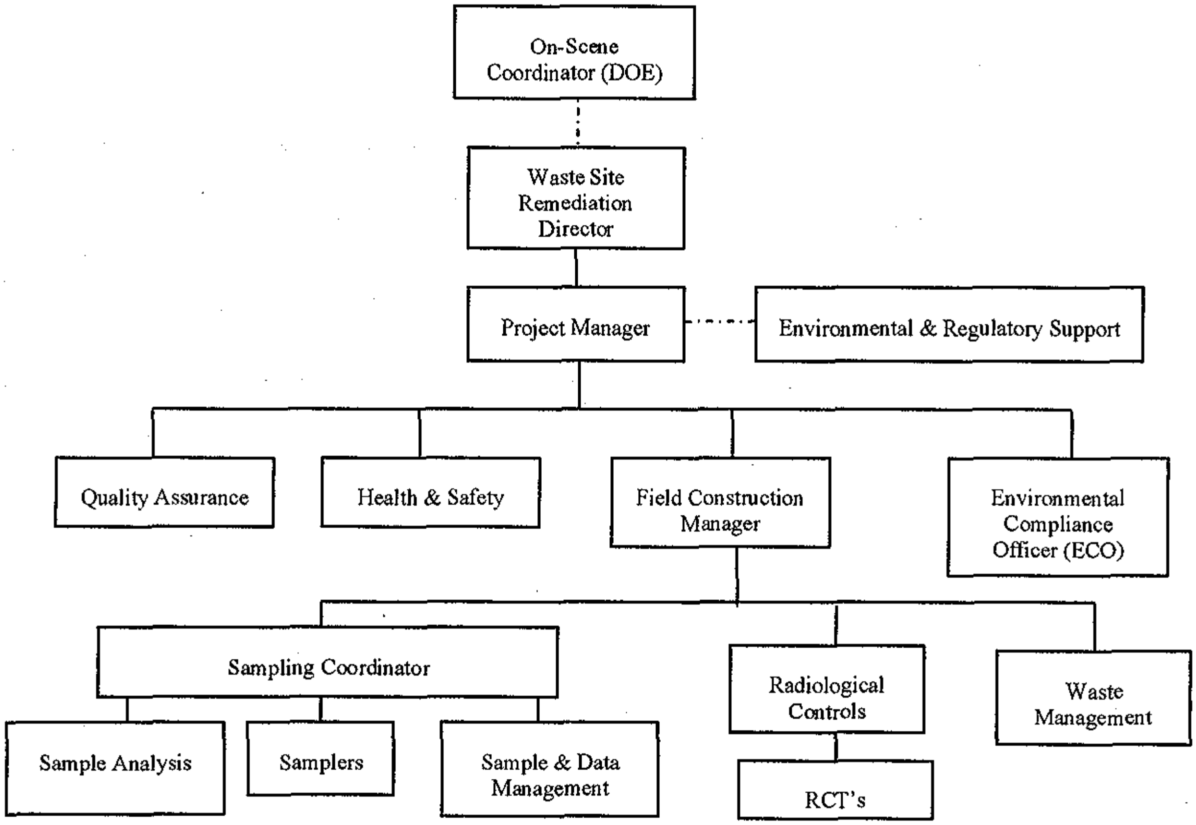

Figure 2-1. Project Organization.

2.1.1.1 On-Scene Coordinator

The On-Scene Coordinator directs response efforts and coordinates all other efforts for this removal action per 40 CFR 300.120(a). Therefore, changes to the field sampling plan may be made in the field by the designated on-scene coordinator. The On-Scene Coordinator is identified in letter 05-AMCP-0428, "U.S. Department of Energy (DOE) Designation of Remedial Project Managers (RPMs) and On-Scene Coordinators (OSCs) for Removal and Remedial Actions Conducted Under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) at the Hanford Site."

2.1.1.2 Waste Site Remediation Director

The Director of Waste Site Remediation provides oversight for all activities and coordinates with the DOE Richland Operations Office (RL), regulators, and primary contractor management in support of sampling activities. In addition, support is provided to the Central Plateau Project Manager to ensure that the work is performed safely and cost-effectively.

2.1.1.3 200-UW-1 Operable Unit Project Manager

The 200-UW-1 OU Project Manager is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The 200-UW-1 OU Project Manager ensures that the Field Construction Manager, Sampling Coordinator, Samplers, and others responsible for implementation of this SAP and QAPjP are provided with current copies of this document and any revisions thereto. The 200-UW-1 OU Project Manager also works closely with the Quality Assurance and Health and Safety organizations and the Field Construction Manager to integrate these and the other lead disciplines in planning and implementing the workscope. The 200-UW-1 OU Project Manager also coordinates with, and reports to RL, the regulators, and primary contractor management on all sampling activities.

2.1.1.4 Quality Assurance

The Quality Assurance Lead is matrixed to the 200-UW-1 OU Project Manager and is responsible for quality assurance (QA) issues on the project. Responsibilities include oversight of implementation of the project QA requirements; review of project documents, including DQO summary reports, SAPs, and the QAPjP; and participation in QA assessments on sample collection and analysis activities, as appropriate.

2.1.1.5 Health and Safety

The Health and Safety organization responsibilities include coordination of industrial safety and health support within the project as carried out through health and safety plans, job hazard analyses, and other pertinent safety documents required by Federal regulation or by internal primary contractor work requirements. In addition, assistance is provided to project personnel in complying with applicable health and safety standards and requirements. Personnel protective clothing requirements are coordinated with Radiological Controls Lead.

2.1.1.6 Field Construction Manager

The Field Construction Manager has the overall responsibility for supporting the Sampling Coordinator in the planning, coordination, and execution of field characterization activities. Responsibilities also include directing training, mock-ups, and practice sessions with field personnel to ensure that the sampling design is understood and can be performed as specified. The Field Construction Manager communicates with the 200-UW-1 OU Project Manager to identify field constraints that could affect the sampling design. In addition, the Field Construction Manager directs the procurement and installation of materials and equipment needed to support the field work.

2.1.1.7 Environmental and Regulatory Support

The Environmental and Regulatory Support Lead is responsible for the performance of U.S. Environmental Protection Agency's 7-step DQO process that, for this project, results in the development of the sampling design. Responsibilities include development and documentation of the sampling DQOs and sampling and analysis plan, which includes the sampling design and associated presentations and the resolution of technical issues. The Environmental and

Regulatory Support Lead also supports the Data Quality Assessment process as described in Section 2.8.

2.1.1.8 Environmental Compliance Officer

The Environmental Compliance Officer provides technical oversight, direction and acceptance of project and subcontracted environmental work and develops appropriate mitigation measures with a goal of minimizing adverse environmental impacts. The Environmental Compliance Officer also reviews plans, procedures and technical documents to ensure that all environmental requirements have been addressed, identifies environmental issues that affect operations and develops cost effective solutions, and responds to environmental/regulatory issues or concerns raised by DOE and/or regulatory agency staff.

2.1.1.9 Sampling Coordinator

The Sampling Coordinator's specific responsibilities include conversion of the sampling design requirements into field task instructions that provide specific direction for field activities. The Sampling Coordinator also provides oversight of the Sample and Data Management Organization and the Field Samplers, develops and oversees the implementation of the Letter of Instruction to the Sample Analysis Contractor, and oversees data validation.

The **Sample and Data Management Organization** selects the laboratories that perform the analyses. This organization also ensures that the laboratories conform to Hanford Site internal laboratory quality assurance requirements, or their equivalent, as approved by RL, the U.S. Environmental Protection Agency, and the Washington State Department of Ecology. Sample and Data Management receives the analytical data from the laboratories, performs the data entry into the *Hanford Environmental Information System* (HEIS), and arranges for data validation.

The **Field Samplers** collect all samples, including replicates/duplicates and prepare all sample blanks according to the sampling and analysis plan and corresponding field procedures and work packages. The Field Samplers also complete the field logbook and chain-of-custody forms, as well as any shipping paperwork. The Field Samplers also deliver the samples to the analytical laboratory.

The **Sample Analysis Organization** analyzes samples in accordance with established procedures and provides necessary sample reports and explanation of results in support of data validation.

2.1.1.10 Radiological Controls

The Radiological Controls Lead is responsible for the radiological/health physics support within the project. Specific responsibilities include conducting as-low-as-reasonably-achievable (ALARA) reviews, exposure and release modeling, and radiological controls optimization for all work planning. In addition, radiological hazards are identified and appropriate controls are implemented to maintain worker exposures to hazards at ALARA levels (e.g., personal protective equipment). Radiological Controls interfaces with the project health and safety representative and plans and directs radiological control technician (RCT) support for all activities.

2.1.1.11 Waste Management

The Waste Management Lead communicates policies and procedures and ensures project compliance for storage, transportation, disposal, and waste tracking in a safe and cost-effective manner. Other responsibilities include identifying waste management sampling/characterization requirements to ensure regulatory compliance and interpreting the characterization data to generate waste designations, profiles, and other documents that confirm compliance with waste acceptance criteria.

2.1.2 Training Requirements

Typical training requirements or qualifications have been instituted by the primary contractor management team to meet training requirements imposed by the Project Hanford Management Contract, regulations, DOE orders, DOE contractor requirements documents, American National Standards Institute/American Society of Mechanical Engineers, *Washington Administrative Code*, etc. For example:

- Training requirements or qualifications needed by sampling personnel will be in accordance with quality assurance requirements.
- The environmental, safety and health training program provides workers with the knowledge and skills necessary to safely execute assigned duties. Field personnel typically will have completed the following training before starting work:
  - Occupational Safety and Health Administration 40-hour hazardous waste worker training and supervised 24-hour hazardous waste site experience
  - 8-hour hazardous waste worker refresher training (as required)
  - Hanford general employee radiation training
  - Radiological worker training.

A graded approach is used to ensure that workers receive a level of training that is commensurate with their responsibilities and that complies with applicable DOE orders and government regulations. Specialized employee training includes pre-job briefings, on-the-job training, emergency preparedness, plan of the day, and facility/worksite orientations.

2.2 FIELD QUALITY CONTROL

Field quality control (QC) samples will be collected to evaluate the potential for cross-contamination and to provide information pertinent to field variability. Field QC for sampling in the Central Plateau will require the collection of field replicates (duplicates), trip or field blanks, and equipment blanks. The QC samples and the required frequency for collection are described in this section, or in Section 3.1.1, Table 3-1, as appropriate.

2.2.1 Field Replicates (Duplicates)

Field replicate (duplicate) samples are used to evaluate sample consistency and the precision of field sampling methods. Field replicate samples are applicable to soil, but are not applicable to biota samples, because the latter are independent units. Because all soil samples will be multi-increment samples, the field replicates will be collected as two additional multi-increment samples in one investigation area; i.e., a total of three multi-increment samples will be collected from the site targeted for field QC. The field replicate samples shall be retrieved from the same depth interval as the primary multi-increment sample but at different randomly-selected locations within each grid. Field duplicates will be collected when conducting discrete or focused sampling.

2.2.2 Field or Trip Blanks

Field or Trip Blanks are collected, containerized and handled in the same manner as the samples. These blanks can be used to indicate sample contamination throughout the entire process (a field blank) or just the shipment process (a trip blank). Field and trip blanks will consist of silica sand, or other appropriate media, placed in containers and analyzed the same as the samples they correspond with.

2.2.3 Equipment Blanks

Equipment blanks are collected for any soil-sampling device that is reused. Equipment blanks will be collected at a frequency of 1 blank per day per matrix or 1 blank per 20 samples per matrix (whichever is more frequent). The field team leader may request that additional equipment blanks be taken. Equipment blanks will consist of silica sand poured over the decontaminated sampling equipment and placed in containers, as identified on the project Sampling Authorization Form.

Equipment blanks will be analyzed for the following, as appropriate:

- Cs-137
- Sr-90
- Tc-99
- Gross alpha and beta/gamma contamination levels.

These analytes are considered to be the best indicators of decontamination effectiveness.

If disposable (i.e., single-use) equipment is used, equipment blanks will not be required.

2.2.4 Prevention of Cross-Contamination

Special care should be taken to prevent cross-contamination of soil samples to avoid the following common ways in which cross-contamination or background contamination may compromise the samples:

- Improperly storing or transporting sampling equipment and sample containers
- Contaminating the equipment or sample bottles by setting the equipment/sample bottle on or near potential contamination sources (e.g., uncovered ground)
- Handling bottles or equipment with dirty hands or gloves
- Improperly decontaminating equipment before sampling or between sampling events.

2.3 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Quality objectives and criteria for soil measurement data are presented in Table 2-2 for all analytes. The ability to meet the detection limit requirements is dependant on the amount of sample obtained and matrix interferences.

2.3.1 Measurement and Testing Equipment

Measurement and testing equipment used in the field or in the laboratory that directly affects the quality of analytical data will be subject to preventive maintenance measures to ensure minimization of measurement system downtime. Laboratories and onsite measurement organizations must maintain and calibrate their equipment. Maintenance requirements (such as parts lists and documentation of routine maintenance) will be included in the individual laboratory and the onsite organization QA plan or operating procedures (as appropriate). Calibration of laboratory instruments will be performed in a manner consistent with SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, as amended, or with auditable DOE Hanford Site and contractual requirements. Calibration of radiological field instruments is discussed in Section 2.7.

Consumables, supplies, and reagents will be reviewed per SW-846 requirements and will be appropriate for their use. Note that contamination is monitored by the QC samples discussed in Section 2.3.3.

Table 2-2. Analytical Performance Requirements.

Data Type	Analyte	Analytical Method	Detection Limit Requirements[a]	Accuracy Req't (% Recovery)	Precision Req't (%RPD)
Performance Requirements for Laboratory Measurements (Radiological)					
Rad	Am-241	AmAEA	1 pCi/g	70-130[b]	±30[b]
Rad	Cs-134	GEA	0.1 pCi/g	70-130[b]	±30[b]
Rad	Cs-137	GEA	0.1 pCi/g	70-130[b]	±30[b]
Rad	Eu-152	GEA	0.1 pCi/g	70-130[b]	±30[b]
Rad	Eu-154	GEA	0.1 pCi/g	70-130[b]	±30[b]
Rad	Np-237	NpAEA	1 pCi/g	70-130[b]	±30[b]

Table 2-2. Analytical Performance Requirements.

Data Type	Analyte	Analytical Method	Detection Limit Requirements[a]	Accuracy Req't (% Recovery)	Precision Req't (%RPD)
Rad	Pu-238	PuAEA	1 pCi/g	70-130[b]	±30[b]
Rad	Pu-239/240	PuAEA	1 pCi/g	70-130[b]	±30[b]
Rad	Ra-226	GEA	0.1 pCi/g	70-130[b]	±30[b]
Rad	Ra-228	GEA	0.2 pCi/g	70-130[b]	±30[b]
Rad	Se-79	ICP-MS	0.1 pCi/g	70-130[b]	±30[b]
Rad	Sr-90	Sr-Gas Proportional Counter	1 pCi/g	70-130[b]	±30[b]
Rad	Tc-99	Chemical separation/liquid scintillation	1 pCi/g	70-130[b]	±30[b]
Rad	Th-232	ICP-MS	1 pCi/g	70-130[b]	±30[b]
Rad	U-233/234	UAEA	1 pCi/g	70-130[b]	±30[b]
Rad	U-235	UAEA	1 pCi/g	70-130[b]	±30[b]
Rad	U-238	UAEA	1 pCi/g	70-130[b]	±30[b]
Performance Requirements for Field Measurements (Radiological)					
Rad	Gross alpha	Portable contamination detector	100 d/min/ 100 cm^2	N/A	N/A
Rad	Gross beta/gamma	Portable contamination detector	5,000 d/min/ 100 cm^2	N/A	N/A
Performance Requirements for Laboratory Measurements (Nonradiological)					
Chem	Ag	EPA 1311/6010/200.8	0.2 mg/kg	70-130[c]	±30[c]
Chem	As	EPA 1311/6010/200.8	2.2 mg/kg	70-130[c]	±30[c]
Chem	Cr	EPA 1311/6010/200.8	1 mg/kg	70-130[c]	±30[c]
Chem	Hg	EPA 1311/6010/200.8	0.2 mg/kg	70-130[c]	±30[c]
Chem	Sb	EPA 1311/6010/200.8	0.6 mg/kg	70-130[c]	±30[c]
Chem	Se	EPA 1311/6010/200.8	10 mg/kg[f]	70-130[c]	±30[c]
Chem	Tl	EPA 1311/6010/200.8	0.5 mg/kg	70-130[c]	±30[c]
Chem	Ti	EPA 1311/6010/200.8	1 mg/kg	70-130[c]	±30[c]
Chem	Uranium (metal)	EPA 1311/6010/200.8	1 mg/kg	70-130[c]	±30[c]

Table 2-2. Analytical Performance Requirements.

Data Type	Analyte	Analytical Method	Detection Limit Requirements[a]	Accuracy Req't (% Recovery)	Precision Req't (%RPD)
Chem	Nitrogen as nitrite	EPA 300.0	0. 5 mg/kg	70-130[c]	±30[c]
Chem	Nitrogen as nitrate	EPA 300.0	0.9 mg/kg	70-130[c]	±30[c]
Chem	Bis (2-ethylhexyl) phthlate	EPA 8270[d]	0.33 mg/kg	70-130[c]	±30[c]
Chem	Di-n-butyl phthlate	EPA 8270[d]	0.66 mg/kg	70-130[c]	±30[c]
Chem	Pentachlorophenol	EPA 8270	0.33 mg/kg	62-114[c]	±30[c]
Chem	Kerosene	NWTPH-K	8 mg/kg	70-130[c]	±30[c]
Chem	Acetone	EPA 8260[e]	0.02 mg/kg	70-130[c]	±30[c]
Chem	Bromomethane	EPA 8260[e]	0.01 mg/kg	70-130[c]	±30[c]
Chem	Chloromethane	EPA 8260[e]	0.01 mg/kg	70-130[c]	±30[c]
Chem	Methylene chloride	EPA 8260[e]	0.005 mg/kg	70-130[c]	±30[c]
Chem	Toluene	EPA 8260[e]	0.005 mg/kg	70-130[c]	±30[c]
Chem	Chloride	EPA 300.0	2 mg/kg	70-130[c]	±30[c]
Chem	Sulfate	EPA 300.0	7 mg/kg	70-130[c]	±30[c]
Chem	Fluoride	EPA 300.0	0.5 mg/kg	70-130[c]	±30[c]
Chem	Asbestos	PLM	<1 wt %	N/A	N/A

[a]Detection limit requirements are taken from DOE/RL-2003-23.

[b]Accuracy criteria for associated batch laboratory control sample percent recoveries. With the exception of GEA, additional analysis-specific evaluations also are performed for matrix spikes, tracers, and carriers as appropriate to the method. Precision criteria for batch laboratory replicate sample analyses. Precision criteria for batch laboratory sample replicate and matrix spike replicate determinations are only applicable when results are greater than 5 to 10 times the method detection limit.

[c]Accuracy criteria for associated batch matrix spike percent recoveries. Evaluation based on statistical control of laboratory control samples also is performed. Precision criteria for batch laboratory replicate matrix spike analyses or replicate sample analyses. Compounds spiked in the laboratory control sample or matrix spike are those specified in SW-846. Criteria based on laboratory statistical control limits are acceptable. Precision criteria for batch laboratory sample replicate and matrix spike replicate determinations are only applicable when results are greater than 5 to 10 times the method detection limit.

[d]There is no recovery data on Semi VOA (EPA 8270) analytes Di-n-butyl phthalate or Bis (2-ehtylhexyl) phthalate since they are never spiked for Laboratory Control Sample (LCS) or Matrix Spike (MS). The list of compounds analyzed for QC purposes are those recommended in EPA SW-846.

[e]For VOA (EPA 8260), the only listed compound in Table 2-1 that has QC specifically associated with it is Toluene. The other listed compounds do not have specific "Accuracy" limits calculated for them. The list of compounds analyzed for QC purposes are those recommended in EPA SW-846.

[f]10 mg/kg is the correct Practical Quantitation Limit for Inductively Coupled Plasma-Mass Spectrometer, assuming the sample does not require additional dilution

BHI-00139, *Environmental Restoration Disposal Facility Waste Acceptance Criteria.*

DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit.*

Four-digit EPA methods are found in SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update III-A.* For EPA Method 200.8, see EPA/600/R-94/111, *Methods for the Determination of Metals in Environmental Samples, Supplement 1.* For EPA Method 300.0, see EPA/600/4-79/020, *Methods of Chemical Analysis of Water and Wastes.*

WAC 173-303, "Dangerous Waste Regulations."

WAC 173-340-700(6)(d), "Overview of Cleanup Standards," "Requirements for Setting Cleanup Levels," "Natural Background and Analytical Considerations."

Table 2-2. Analytical Performance Requirements.

Data Type	Analyte	Analytical Method	Detection Limit Requirements[a]	Accuracy Req't (% Recovery)	Precision Req't (%RPD)

AEA = alpha energy analysis.
COC = contaminant of concern.
COPC = contaminant of potential concern.
d/min = disintegrations per minute.
EPA = U.S. Environmental Protection Agency.
GEA = gamma energy analysis.
N/A = not applicable.
NWTPH-K = Northwest total petroleum hydrocarbon – kerosene.
PLM = polarized light microscopy.
RPD = relative percent difference.
WAC = *Washington Administrative Code*.

2.3.2 Laboratory Sample Custody

Sample custody during laboratory analysis will be addressed in the applicable laboratory standard operating procedures. Laboratory custody procedures will ensure the maintenance of sample integrity and identification throughout the analytical process.

2.3.3 Quality Assurance Objective

The QA objective of this plan is to develop implementation guidance that will provide data of known and appropriate quality. Data quality is assessed by representativeness, comparability, accuracy, precision, and completeness. The applicable QC guidelines, quantitative target limits, and levels of effort for assessing data quality are dictated by the intended use of the data and the nature of the analytical method. Each of these is addressed below.

2.3.3.1 Representativeness

Representativeness is a measure of how closely the results reflect the actual concentration and distribution of the radiological constituents in the matrix sampled. Sampling plan design, sampling techniques, and sample handling protocols (e.g., storage, preservation, transportation) have been developed and are discussed in subsequent sections of this document. The documentation will establish that protocols have been followed and will ensure sample identification and integrity.

2.3.3.2 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Data comparability will be maintained using standard procedures, consistent methods, and consistent units. Table 2-2 lists applicable fixed laboratory methods for analytes and target detection limits. Actual detection limits will depend on the sample matrix and the sample quantity available. Data will be reported as defined for specific samples.

2.3.3.3 Accuracy

Accuracy is an assessment of the closeness of the measured value to the true value. Radionuclide measurements that require chemical separations use this technique to measure method performance. For radionuclide measurements that are analyzed by gamma spectroscopy, laboratories typically compare results of blind audit samples against known standards to establish accuracy. Validity of calibrations are evaluated by comparing results from the measurement of a standard to known values and/or by generation of in-house statistical limits based on three standard deviations (+/- 3s). Table 2-2 lists the accuracy provided for fixed laboratory analyses for the project.

2.3.3.4 Precision

Precision is a measure of the data spread when more than one measurement has been taken on the same sample. Precision can be expressed as the relative percent difference for duplicate measurements. Analytical precision for fixed laboratory analyses are listed in Table 2-2.

2.3.3.5 Completeness

Completeness is a measure of the amount of valid data obtained from the analytical measurement process and the complete implementation of defined field procedures.

2.3.3.6 Detection Limits

Detection limits are functions of the analytical method used to provide the data and the quantity of the sample available for analyses.

2.3.4 Laboratory Quality Control

The laboratory method blanks and laboratory control sample/blank spike are defined in Chapter 1 of SW-846 and will be run at the frequency specified in Chapter 1 of SW-846.

2.4 SAMPLE PRESERVATION, CONTAINERS, AND HOLDING TIMES

Soil sample preservation, containers, and holding times for the nonradiological and radiological analytes of interest and physical property tests are presented in Table 2-3. Final sample collection requirements will be identified on a sampling analysis form/chain-of-custody.

Table 2-3. Sample Preservation, Container, and Holding Time Guidelines.

Analytes	Matrix	Bottle		Amount[a,b]	Preservation	Packing Requirements	Holding Time[d]
		Number	Type				
Radionuclides							
Americium-241	Soil	1	G/P	10-1000 g	None	None	None
Thorium-232	Soil	1	G/P	10-1000 g	None	None	None
Cesium-137	Soil	1	G/P	100-1500 g	None	None	None
Cesium-134	Soil	1	G/P	100-1500 g	None	None	None
Cobalt-60	Soil	1	G/P	100-1500 g	None	None	None
Europium-152	Soil	1	G/P	100-1500 g	None	None	None
Europium-154	Soil	1	G/P	100-1500 g	None	None	None
Neptunium-237	Soil	1	G/P	10-1000 g	None	None	None
Plutonium-238	Soil	1	G/P	10-1000 g	None	None	None

Table 2-3. Sample Preservation, Container, and Holding Time Guidelines.

Analytes	Matrix	Bottle		Amount[a,b]	Preservation	Packing Requirements	Holding Time[d]
		Number	Type				
Plutonium-239/240	Soil	1	G/P	10-1000 g	None	None	None
Strontium-90	Soil	1	G/P	10-1000 g	None	None	None
Technetium-99	Soil	1	G/P	10-1000 g	None	None	None
Selenium-79	Soil	1	G/P	10-1000 g	None	None	None
Uranium-233/234	Soil	1	G/P	10-1000 g	None	None	None
Uranium-235	Soil	1	G/P	10-1000 g	None	None	None
Uranium-238	Soil	1	G/P	10-1000 g	None	None	None
Radium-226	Soil	1	G/P	10-1000 g	None	None	None
Radium-228	Soil	1	G/P	10-1000 g	None	None	None
Nonradionuclides							
Asbestos	Soil	1	G	40 g	None	Cool 4 °C	14 days
PCBs	Soil	1	aG	120 g	None	Cool 4 °C	14/40 days
ICP metals	Soil	1	G/P	10-500 g	None	None	6 months
Mercury	Soil	1	G	5-125 g	None	None	28 days
NWTPH-K	Soil	1	G	125-250 g	None	Cool 4 °C	14 days
300.0[c] – nitrate	Soil	1	G/P	50-100 g	None	Cool 4 °C	NA/48 hours[e]
353.N[c] – nitrate + nitrite	Soil	1	G/P	50-100 g	None	Cool 4 °C	28 days
Volatile organics	Soil	1	G	50-100 g	None	Cool 4 °C	14 days
Semi-volatile organics	Soil	1	G	50-100 g	None	Cool 4 °C	14/40 days
Chloride	Soil	1	G/P	50-100 g	None	Cool 4 °C	28 days
Sulfate	Soil	1	G/P	50-100 g	None	Cool 4 °C	28 days
Fluoride	Soil	1	G/P	50-100 g	None	Cool 4 °C	28 days

[a] Optimal volumes, which may be adjusted downward to accommodate the possibility of retrieval of small amount of sample. Minimum sample size will be defined in the Sampling Authorization Form.

[b] Mixed soil samples may be obtained and submitted to the analytical laboratory for analyses for specific analytes including: Radionuclides – 100 g of soil for all radionuclides (except C-14, tritium, and Tc-99; they require approximately 10 g each sample); Chemicals – a 10 g soil sample is required for all ICP analyses, a 10 g soil sample is required for IC anion analysis, a 5 g soil sample for hexavalent chromium analysis, a 10 g soil sample for NWTPH-K analysis, and 125 g soil samples for Method 8270 analyses (SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*).

[c] For Test Method 300.0, see EPA/600/4-79/020, *Methods of Chemical Analysis of Water and Wastes*; for Test Methods 353.N, see EPA/600/4-79/020 and EPA/600/R-93/100, *Methods for the Determination of Inorganic Substances in Environmental Samples*.

[d] Where two numbers are indicated with a "/" in between, the first number is the time from sample collection to extraction, and the second number is after extraction through analysis.

[e] For nitrate using method 300.0, there is no holding time prior to extraction.

aG	=	amber glass.	NWTPH-K	=	northwest total petroleum hydrocarbons-kerosene.
G	=	glass.	P	=	plastic.
IC	=	ion chromatography.	PCB	=	polychlorinated biphenyl.
ICP	=	inductively coupled plasma.			

2.5 ONSITE MEASUREMENTS QUALITY CONTROL

The collection of QC samples for onsite measurement QC is not applicable to the field-screening techniques described in this SAP. Field-screening instrumentation will be calibrated and controlled according to Sections 2.7, as applicable.

2.5.1 Assessment/Oversight

Routine evaluation of data quality described for this project will be documented and filed along with the data in the project file.

2.5.2 Assessments and Response Action

The primary contractor Regulatory Compliance group may conduct random surveillance and assessments to verify compliance with the requirements outlined in this SAP, project work packages, procedures, and regulatory requirements.

Deficiencies identified by these assessments will be reported in accordance with existing programmatic requirements. Central Plateau Projects Quality Assurance coordinates the corrective actions/deficiencies in accordance with the primary contractor QA program. When appropriate, corrective actions will be taken by the 200-UW-1 OU Project Manager.

2.5.3 Reports to Management

Management will be made aware of all deficiencies identified by self-assessments. Identified deficiencies will be reported to the primary contractor Director, Waste Site Remediation, as appropriate.

2.6 DATA MANAGEMENT

Analytical data resulting from the implementation of this QAPjP will be managed and stored in accordance with the applicable programmatic requirements governing data management procedures. At the direction of the Project Manager, all analytical data packages will be subject to final technical review by qualified personnel before they are submitted to the regulatory agencies or included in reports. Electronic data access, when appropriate, will be via a database (e.g., HEIS or a project-specific database). Where electronic data are not available, hard copies will be provided in accordance with Section 9.6 of the Tri-Party Agreement (Ecology et al. 2003).

Planning for sample collection and analysis will be in accordance with the programmatic requirements governing fixed laboratory sample collection activities, as discussed in the sample team's procedures. In the event that specific procedures do not exist for a particular work evolution, or it is determined that additional guidance to complete certain tasks is needed, a work package will be developed to adequately control the activities, as appropriate. Examples of the sample team's requirements include activities associated with the following:

- Chain of custody/sample analysis requests
- Project and sample identification for sampling services
- Control of certificates of analysis
- Logbooks, checklists

- Sample packaging and shipping.

Approved work control packages and procedures will be used to document radiological measurements when this SAP is implemented. Examples of the types of documentation for field radiological data include the following:

- Instructions regarding the minimum requirements for documenting radiological controls information as per 10 CFR 835, "Occupational Radiation Protection"
- Instructions for managing the identification, creation, review, approval, storage, transfer, and retrieval of primary contractor radiological records
- The minimum standards and practices necessary for preparing, performing, and retaining radiological-related records
- The indoctrination of personnel on the development and implementation of sample plans
- The requirements associated with preparing and transporting regulated material.

2.6.1 Resolution of Analytical System Errors

Errors reported by the laboratories are reported to the Sampling Coordinator, who initiates a Sample Disposition Record in accordance with primary contractor procedures. This process is used to document analytical errors and to establish resolution with the Project Manager. In addition, the primary contractor QA receives quarterly reports that provide summaries and summary statistics of the analytical errors.

2.7 VALIDATION AND VERIFICATION REQUIREMENT

Completed data packages will be validated by qualified primary contractor Sample and Data Management personnel or by a qualified independent contractor. Validation will consist of verifying required deliverables, requested versus reported analyses, and transcription errors. Validation also will include evaluating and qualifying the results based on holding times, method blanks, laboratory control samples, laboratory duplicates, and chemical and tracer recoveries, as appropriate. No other validation or calculation checks will be performed.

Level C data validation as defined in the contractor's validation procedures, which are based on EPA functional guidelines (Bleyler 1988a, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*; Bleyler 1988b, *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*), will be performed for up to 5 percent of the data by matrix and analyte group. Analyte group refers to radionuclides, volatile chemicals, semivolatiles, PCBs, metals, anions, etc. The goal is to cover the various analyte groups and matrices during the validation.

When outliers or questionable results are identified in the data quality assessment, additional data validation will be performed. The additional validation will be up to 5 percent of the statistical outliers and/or questionable data. The additional validation will begin with Level C and may increase to Levels D and E as needed to ensure that the data are usable. Note that Level C validation is a review of the QC data, while Levels D and E include review of calibration data and calculations of representative samples from the dataset. All data validation will be documented in data validation reports. An example of questionable data is the positive detections greater than the practical quantitation limit or reporting limit in soil from a reference site that should not have exhibited contamination. Similarly, results below background would not be expected and could trigger a validation inquiry. With the exception of "R" qualified or rejected data, all data will be used.

At least one data validation package will be generated. Validation requirements identified in this section are consistent with Level C validation, as defined in data validation procedures. Relative to analytical data in sample media, physical data and/or field screening results are of lesser importance in making inferences of risk. Because of the secondary importance of such data, no validation for physical property data and/or field screening results will be performed. However, field QA/QC will be reviewed to ensure that the data are useable. Field instrumentation, calibration, and QA checks will be performed in accordance with the following.

- Calibration of radiological field instruments on the Hanford Site is performed under contract by Pacific Northwest National Laboratory, as specified in their program documentation.

- Daily calibration checks will be performed and documented for each instrument used to characterize areas that are under investigation. These checks will be made on standard materials that are sufficiently like the matrix under consideration that direct comparison of data can be made. Analysis times will be sufficient to establish detection efficiency and resolution.

The approval of field-data collection plans by the Radiological Controls organization represents the data validation and usability review for handheld field radiological measurements.

2.8 DATA QUALITY ASSESSMENT

The Data Quality Assessment (DQA) process compares completed field sampling activities to those proposed in corresponding sampling documents and provides an evaluation of the resulting data. The purpose of the data evaluation is to determine if quantitative data are of the correct type and are of adequate quality and quantity to meet the project DQOs. The U.S. Environmental Protection Agency DQA process, EPA/600/R-96/084, *Guidance for Data Quality Assessment*, identifies five steps for evaluating data generated from this project, as summarized below:

Step 1. Review Data Quality Objectives and Sampling Design. This step requires a comprehensive review of the sampling and analytical requirements outlined in the project-specific DQO summary report and SAP.

Step 2. Conduct a Preliminary Data Review. In this step, a comparison is made between the actual QA/QC achieved (e.g., detection limits, precision, accuracy, completeness) and the requirements determined during the DQO. Any significant deviations will be documented. Basic statistics will be calculated from the analytical data at this point, including an evaluation of the distribution of the data.

Step 3. Select the Data Analyses. Using the data evaluated in Step 2, select appropriate statistical hypothesis tests or graphical data analyses and justify this selection.

Step 4. Verify the Assumptions. Assess the validity of the data analyses by determining if the data support the underlying assumptions necessary for the analyses or if the data set must be modified (e.g., transposed, augmented with additional data) before further analysis. If one or more assumptions is questioned, return to Step 3.

Step 5. Draw Conclusions from the Data. The analyses are applied in this step, and the results will be used to select among four possible outcomes for each COC.

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3.0 FIELD SAMPLING PLAN

3.1 SAMPLING OBJECTIVES

The primary objective of the field sampling plan is to clearly identify and describe the sampling and analysis activities that will be conducted to support the 200-UW-1 OU Support Activities project decisions. The field sampling plan uses the sampling approaches developed in the DQO process (CP-26827) and subsequent workshops with RL, EPA, and Ecology as the basis for the site-specific sampling plan presented in the following sections. The overall sampling strategy is outlined in Table 3-1. Changes to the field sampling plan may be made in the field by the designated on-scene coordinator. The On-Scene Coordinator is identified in 05-AMCP-0428, "U.S. Department of Energy (DOE) Designation of Remedial Project Managers (RPMs) and On-Scene Coordinators (OSCs) for Removal and Remedial Actions Conducted Under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) at the Hanford Site."

3.1.1 Field Measurements

Surface Radiation Survey. A surface radiation survey will be performed at the areas to be removed as part of this project (soil, clay pipe, crib vent risers, and TEDF pipeline), to document existing surface contamination and to support preparation of supporting health and safety documentation. Surface radiation surveys will be conducted by qualified radiological control technicians. A survey report will be prepared documenting the results of each survey. Post-sampling surveys also will be performed at each sampling site to ensure that sampling activities have not contributed to surface contamination.

Radiological Screening. For the sampling effort in the 200-W-42 VCP and associated excavation, field screening will be used to establish site radiological contamination levels. In addition, field screening for radiological contamination will be used as a tracer to locate areas of chemical contamination, because process knowledge shows that all of the discharges to the 200-W-42 VCP and associated cribs contained both radiological and chemical constituents. If field-screening results indicate the presence of Cs-137, the areas with the highest levels of contamination will be further characterized with analytical samples to bound the contaminants.

A similar strategy will be used for the crib vent risers. Radiological smear samples and field instruments will be used to determine if radiological contamination (Cs-137) is present. If present, laboratory analyses will be performed to determine radiological concentrations present in the risers.

The portion of TEDF pipeline to be removed and disposed of is not expected to be contaminated with radiological or chemical contaminants, based on process knowledge, effluent sample data, and administrative controls imposed by TEDF to eliminate regulated discharges to the system. Therefore, only a confirmatory field radiological smear from the interior of the pipeline is anticipated to be required to confirm process knowledge.

Table 3-1. 200-UW-1 Operable Unit Support Activities Sampling Plan.

Waste Stream	Data Needs	Recommended Sampling Approach	Location and Number of Samples	COPCs and COCs
Vitrified clay pipe.	Radiological and chemical data for characterization for waste disposal.	• Perform visual inspection of pipeline conditions during excavation; document condition. • Perform field radiological survey of excavated pipeline; document results. • Using Cs-137 as a tracer, collect one biased sample of clay pipe at highest radiological survey reading and split between two containers for laboratory analysis; also collect one trip blank. • Perform full suite of WSCF laboratory analyses for radiological and chemical constituents listed in Table 1-2. • Photographic documentation of the sampling activities may be used for documentation purposes. • A portion of clay pipe may be archived for use in future remedial action decision making. • A radiological survey report will be prepared to document the field information gathered.	Collect one biased pipe sample at highest field radiological survey reading (split sample into two samples) plus one trip blank for laboratory analysis.	All radiological and chemical constituents listed in Table 1-2.
200-W-42 VCP Excavation: Trench between 216-U-8 and 216-U-12 Cribs and area just north of 216-U-8 Crib. *NOTE: Due to the width of the trenches, the walls will not be sampled, only the bottom of each trench.* *Also, both trenches will be considered 1*	Radiological and chemical data for characterization for waste site closeout.	• Perform visual inspection of soil conditions and any visible releases under the VCP line; document conditions. • Perform field radiological survey of excavated trenches, using Cs-137 as a tracer; document results. • If minimal areas of detectable contamination are located, flags will be placed at areas with readings for use in sample collection. • If radiological contamination is widespread, the trench will be sectioned into 1 m (3-ft) grids, with a reading taken at each grid and documented. • For the area between 216-U-8 and 216-U-12 Cribs, collect 1 multi-incremental sample plus 2 replicate samples for analyses and 2 discrete volatile samples with 1 trip blank for volatile analyses only. • For the excavation area on the north side of 216-U-8 Crib, collect 1 multi-incremental sample and 2 discrete volatile samples with 1 trip blank for volatile analyses only. • Perform full suite of WSCF laboratory analyses for radiological and chemical constituents listed in Table 1-2. • Photographs of the sampling activities should be used for	**Between 216-U-8 and 216-U-12 Cribs:** Collect 1 multi-incremental sample plus 2 replicate samples for analyses and 2 discrete volatile samples with 1 trip blank for volatile analyses only. All samples will be collected from 0-2 inches in depth. **Excavation north of 216-U-8 Crib:** Collect 1 multi-incremental sample and 2 discrete volatile samples with 1 trip blank for volatile	All radiological and chemical constituents listed in Table 1-2.

Table 3-1. 200-UW-1 Operable Unit Support Activities Sampling Plan.

Waste Stream	Data Needs	Recommended Sampling Approach	Location and Number of Samples	COPCs and COCs
decision unit for this sampling activity.		documentation purposes whenever possible. • A detailed grid system and an accompanying global positioning system (GPS) identifying the trench boundary location, or a grid system that has a permanent above-ground reference point will be used to document the location of sample points in the excavations. • A radiological survey report will be prepared to document the field information gathered.	analyses only. All samples will be collected from 0-2 inches in depth. Each multi-incremental sample and replicates will consist of a minimum of 50 sampling increments combined, and with a 20-gram minimum sample amount for each of the different analyses to be completed.	
200-W-42 VCP Excavation: Trench beginning at the north of the initial excavation, which is north of 216-U-8 Crib and the south side of 16th Street and the trench north of 16th Street to the 270-W Tank. *NOTE: Both trenches will be considered 1 decision unit for this sampling*	Radiological and chemical data for characterization for waste site closeout.	• Perform visual inspection of soil conditions and any visible releases under the VCP line; document conditions. • Perform field radiological survey of excavated trenches, using Cs-137 as a tracer, document results. • If minimal areas of detectable contamination are located, flags will be placed at areas with readings for use in sample collection. • If radiological contamination is widespread, the trench will be sectioned into 1 m (3-ft) grids, with a reading taken at each grid and documented. • For the area between the end of the initial excavation north of 216-U-8 and the south side of 16th Street, collect 1 multi-incremental sample plus 2 replicate samples for analyses and 2 discrete volatile samples with 1 trip blank for volatile analyses only. • For the excavation area on the north side of 16th Street to the 270-W Tank, collect 1 multi-incremental sample plus 1 replicate sample and 2 discrete volatile samples with 1 trip blank for volatile analyses only.	**Trench beginning at the north of the initial excavation, which is north of 216-U-8 Crib and the south side of 16th Street:** Collect 1 multi-incremental sample plus 2 replicate samples for analyses and 2 discrete volatile samples with 1 trip blank for volatile analyses only. All samples will be collected from 0-2 inches in depth. **Trench north of 16th**	All radiological and chemical constituents listed in Table 1-2.

Table 3-1. 200-UW-1 Operable Unit Support Activities Sampling Plan.

Waste Stream	Data Needs	Recommended Sampling Approach	Location and Number of Samples	COPCs and COCs
activity. *The need for sampling of the lengthwise sidewalls will be determined after radiological field surveys have been completed.*		• Perform full suite of WSCF laboratory analyses for radiological and chemical constituents listed in Table 1-2. • Photographs of the sampling activities should be used for documentation purposes whenever possible. • A detailed grid system and an accompanying global positioning system (GPS) identifying the trench boundary location, or a grid system that has a permanent above-ground reference point will be used to document the location of sample points in the excavations. • A radiological survey report will be prepared to document the field information gathered.	**Street to the 270-W Tank:** Collect 1 multi-incremental sample plus 1 replicate sample and 2 discrete volatile samples with 1 trip blank for volatile analyses only. All samples will be collected from 0-2 inches in depth. Each multi-incremental sample and replicates will consist of a minimum of 50 sampling increments combined, and with a 20-gram minimum sample amount for each of the different analyses to be completed.	

Table 3-1. 200-UW-1 Operable Unit Support Activities Sampling Plan.

Waste Stream	Data Needs	Recommended Sampling Approach	Location and Number of Samples	COPCs and COCs
Spoil Piles Used as Backfilling Material	Radiological and chemical data for characterization for waste site closeout.	• Perform field radiological survey of spoil pile during excavation of trenches, using Cs-137 as a tracer; document results. • Randomly collect 5 discrete samples plus 1 field duplicate and 1 field blank from the spoil pile for each separate trench excavation. • Photographs of the sampling activities should be used for documentation purposes whenever possible. • A radiological survey report will be prepared to document the field information gathered.	Collect 5 discrete samples plus 1 duplicate and 1 field blank from the spoil pile from a depth of 0-2 inches, for each separate trench. If no excavated soil is saved for backfilling, no sampling will be needed.	All radiological and chemical constituents listed in Table 1-2, excluding volatile organic compounds.
216-U-8 and 216-U-12 Crib vent risers.	Radiological data for characterization for waste disposal.	• Collect radiological smear samples from the inside of each crib vent riser and take readings using Cs-137 as a tracer; document results. • Highest detected smear sample will be sent to the WSCF laboratory for radiological analyses only. • If no detectable radiological contamination can be identified using field instruments for direct readings on the risers and smear samples, then no further analyses will be conducted. • Photographs of the sampling activities should be used for documentation purposes whenever possible. • A radiological survey report will be prepared to document the field information gathered.	Collect a radiological smear sample from inside of each of the three risers. The smear sample with the highest reading will be taken to the laboratory for analyses, along with one field blank.	Radiological constituents listed in Table 1-2.
Concrete pad near the 216-U-8 and 216-U-12 Cribs.	Radiological and chemical data for characterization for waste disposal.	• Perform visual inspection of the concrete slab and document any visible signs of spills. • Grid the concrete pad and collect 1 random concrete sample for laboratory analyses; also collect 1 field duplicate and 1 trip blank. • Photographs of the sampling activities should be used for documentation purposes whenever possible. • A radiological survey report will be prepared to document the field information gathered.	Collect 1 random concrete sample from the pad plus 1 trip blank and 1 field duplicate for laboratory analyses.	All radiological and chemical constituents listed in Table 1-2.

Table 3-1. 200-UW-1 Operable Unit Support Activities Sampling Plan.

Waste Stream	Data Needs	Recommended Sampling Approach	Location and Number of Samples	COPCs and COCs
TEDF pipeline.	Radiological data to confirm process knowledge.	• Collect radiological smear sample from inside of piping and survey using field instruments. • If no detectable radiological contamination can be identified using field instruments for direct readings on the pipeline and smear sample, then no further analyses will be conducted. • Photographs of the sampling activities should be used for documentation purposes whenever possible. • A radiological survey report will be prepared to document the field information gathered.	Collect one radiological smear sample from inside of pipe. The smear sample will be taken to the laboratory for analyses, along with one field blank.	Radiological constituents listed in Table 1-2. Sampling only to confirm process knowledge of pipeline.

Note: Equipment blanks will be collected as described in Section 2.2.3.

COC = contaminant of concern.
COPC = contaminant of potential concern.
TEDF = Treated Effluent Disposal Facility.
VCP = vitrified clay pipe.
WSCF = Waste Sampling and Characterization Facility.

Before sampling begins, a local background activity reading will be taken at a location selected in the field. Field screening will be used to identify detectable radiological contamination, adjust sampling points if needed, assist in determining sample shipping requirements, determine equipment/personnel decontamination needs, and support worker health and safety monitoring.

Field-screening instruments will be used, maintained, and calibrated in accordance with the instrument program, manufacturers' specifications, and other approved procedures.

3.1.2 Media Sampling and Analysis

For the 200-W-42 VCP, the surrounding soil, crib vent risers, and TEDF pipeline, samples will be collected from site locations where existing analytical data, process history, and/or field survey results indicate maximum contamination, or "worst case," concentrations are expected to establish the maximum concentrations of the contamination. The number of samples collected for a focused design will be determined judgmentally.

For the bottom of each portion of the 200-W-42 Trench, the multi-incremental sampling process will be utilized, except for the collection of volatile organic compounds, which will still be collected as discrete samples.

Because of the lack of process knowledge associated with the concrete pad adjacent to the 216-U-8 and 216-U-12 Cribs, random sampling will be performed. The pad will be divided into a grid (1 by 1 m [3- by 3-ft] sections) and 1 random sample will be collected from the concrete to establish data for characterization. Because of the proximity of the concrete pad to the cribs and VCP, the list of COPCs and COCs in Table 1-2 will be used to guide characterization of the pad.

3.2 SAMPLING LOCATIONS AND FREQUENCY

Table 3-1 lists the sampling techniques and the samples required for the 200-UW-1 OU Support Activities project. Table 3-1 also summarizes the number of samples required for each location or media. While it is expected that the sample locations will be sampled once, all the sites or media are accessible and additional sampling may be conducted if the initial results prove to be insufficient to support site remediation decisions.

3.3 SAMPLING PROCESSES

The sampling processes to be implemented in the field shall be implemented consistent with the requirements outlined in the *Hanford Federal Facility Agreement and Consent Order Action Plan,* Section 7.8, "Quality Assurance." The project will use the Sampling and Mobile Laboratory organization or other approved sampling organization to perform the sample collection associated with the 200-UW-1 OU Support Activities project. The approved sampling organization will perform the sample collection activities in accordance with established instructions for sample collection, collection equipment, and sample handling.

3.4 SAMPLE MANAGEMENT

Sample and data management activities will be performed in accordance with the prime contractor quality assurance program. Sample preservation, container, and holding-time requirements will be indicated on Chain-of-Custody/Sample Analysis Request forms in accordance with SW-846, and the specific analytical method prepared for specific sample events.

Soil sampling and field measurements will be conducted according to the following approved work processes.

Sample Identification. The *Sample Data Tracking System* database will be used to track the samples through the collection and laboratory analysis process. The HEIS database is the repository for the laboratory analytical results. HEIS sample numbers will be issued to the sampling organization. Each sample will be identified and labeled with a unique HEIS sample number. The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook.

Each sample container will be labeled with the following information, using a waterproof marker on firmly affixed, water-resistant labels:

- HEIS number
- Sample collection date/time
- Name/initials of person collecting the sample
- Analysis required
- Preservation method, if applicable.

Field Sampling Log. All information pertinent to field sampling and analysis will be recorded in bound logbooks in accordance with SW-846. The sampling team will be responsible for recording all relevant sampling information. Entries made in the logbook will be dated and signed by the individual who made the entry.

Sample Custody. A chain-of-custody record will be initiated at the time of sampling and will accompany each set of samples shipped to the laboratory. The analyses requested for each sample will be indicated on the accompanying Chain-of-Custody/Sample Analysis Request form. Chain-of-custody procedures will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained. Each time responsibility for custody of the sample changes, the new and previous custodians will sign the record and note the date and time. The sampler will make a copy of the signed record before the sample is shipped and will transmit it to Environmental Information System (EIS) Sample and Data Management within 24 hours of shipping.

A custody seal (i.e., evidence tape) will be affixed to the lid of each sample jar in a manner that would indicate tampering. The container seal will be inscribed with the sampler's initials and the date sealed.

Sample Containers and Preservatives. Level I EPA precleaned sample containers will be used for soil samples. Container sizes may vary, depending on laboratory-specific volumes needed to meet analytical detection limits. If, however, the dose rate on the outside of a sample jar, or the curie content, exceeds levels acceptable by an offsite laboratory, the Sampling Coordinator/Field Samplers can send smaller volumes to the laboratory after consultation with EIS Sample and Data Management to determine acceptable volumes. Final container types and volumes will be provided by the WSCF Sampling and Characterization Facility (WSCF) and the Sampling and Mobile Laboratory organization.

Sample Shipping. A radiological control technician will survey each sample jar to verify that the container is free of smearable surface contamination. The radiological control technician also will measure the radiological activity on the outside of the sample container (through the container) and will mark the container with the highest contact radiological reading in either disintegrations per minute or millirem per hour, as applicable. Total activity analysis performed by the Radiological Counting Facility, the 222-S Laboratory, or another suitable onsite laboratory will be used for determining U.S. Department of Transportation shipping criteria. This information, along with other data that may prequalify the samples, will be used to select proper packaging, marking, labeling, and shipping paperwork in accordance with U.S. Department of Transportation regulations (49 CFR, "Transportation") and to verify that the sample can be received by the offsite analytical laboratory. The sampler will send copies of the shipping documentation to EIS Sample and Data Management within 24 hours of shipping.

As a general rule, samples will be sent to the WSCF. Samples with activities less than 1 mR/h may be shipped to an offsite laboratory. Samples with activities between 1 and 10 mR/h also may be shipped to an offsite laboratory, but must first be evaluated by EIS Sample and Data Management. Samples with activities greater than 10 mR/h will be sent to an onsite laboratory arranged by EIS Sample and Data Management.

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4.0 HEALTH AND SAFETY

All field operations will be performed in accordance with prime contractor health and safety requirements outlined in D&D-27507, *Health and Safety Plan to Support Activities for the 200-UW-1 Operable Unit*. In addition, a work control package will be prepared that will further control site operations. This work package will include an activity hazard analysis, and will reference applicable radiological control requirements.

The sampling processes and associated activities will take into consideration exposure reduction and contamination control techniques that will minimize radiation exposure to the sampling team, as required by minimum requirements established by 10 CFR 835, and provide the basis for consistent and uniform implementation of radiological control requirements.

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5.0 MANAGEMENT OF WASTE

All waste (including unexpected waste) generated by sampling activities will be managed in accordance with the waste management portion of the removal action work plan (DOE/RL-2005-78). Unused samples and associated laboratory waste for the analysis will be dispositioned in accordance with the laboratory contract and agreements for return to the project site. Pursuant to 40 CFR 300.440, Ecology Project Manager approval is required before returning unused samples or waste from offsite laboratories.

In addition, Ecology Project Manager approval is required before shipping sample waste from Hanford onsite laboratories (e.g., 222-S Analytical Laboratories or WSCF) back to the waste site of origination.

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